

CLAIMS

1. A digital image capture apparatus configured to capture an image of a document (102) at least partially illuminated by ambient light, the apparatus comprising:
- an image capture device (101) comprising a detector (107) adapted to capture an image of said document;
- an illumination source (106) for illuminating said document,
- a detector read-out circuit (108) for capturing image data from said detector (107) in response to a control signal;
- a controller for controlling said detector read-out circuit (108) and said illumination source (106), wherein said controller provides a first control signal to said read-out circuit (108) to capture a first image of said document (102) when illuminated by said illumination source (106) at a first intensity and by said ambient light to produce a first image, and wherein said controller further provides a second control signal to said read-out circuit to capture a second image of said document (102) when said document (102) is illuminated by said illumination source at a second, lower, intensity and by said ambient light, said second, lower, intensity having a value greater than or equal to zero intensity but less than the first intensity; and
- a processor (112) arranged to process said first captured image with said second captured image to produce a final image of said document.
2. Apparatus according to claim 1 wherein said first image and said second image are captured with substantially a same exposure and said processor (112) is arranged to combine said first captured image and said second captured image to form a final image by subtracting said second image from said first image.

3. Apparatus according to claim 2 wherein said processor (112) includes a low pass filter, and wherein at least one of said captured images is passed through said low pass filter prior to subtraction.

5 4. Apparatus according to claim 3 wherein only said second captured image is low-pass filtered.

5. Apparatus according to claim 1 wherein said second image is captured with a longer exposure than said first image, and wherein said
10 illumination source (116) has an intensity during capture of said second image of zero, and wherein said processor (112) is arranged to combine said two captured images to form a final image, said processor (112) including an identifying stage for identifying areas in said first captured
15 image that correspond to glare spots, and a replacement stage for replacing those points with values dependent upon values of corresponding areas in said second image.

6. Apparatus according to claim 5 wherein an exposure of said first image and an exposure of said second image are selected to provide a full
20 exposure for each of said images.

7. Apparatus according to claim 5 wherein said processor pre-processes said second image prior to combining with said first image to compensate for differences in at least one of colour temperature and exposure profile
25 and distribution of light between said ambient light and light from said illumination source.

8. Apparatus according to claim 2, wherein said controller provides a third control signal to said read-out circuit (108) to capture a third image of
30 said document (102) when said document (102) is illuminated by said

- ambient light without being illuminated by said illumination source, said third image having a longer exposure than said first image; and wherein said processor is arranged to combine said three captured images to form a final image, said processor (112) including a combination stage arranged to subtract said second image from said first image to form a processed first captured image, an identifying stage for identifying areas or points in said processed first captured image that correspond to glare spots, and a replacement stage for replacing those points with values dependent upon the values at corresponding areas or points in said third image.
9. Apparatus according to claim 8 wherein an exposure for said first image and said third image are selected to provide a full exposure for each of said first image and said second image.
10. Apparatus according to claim 8 wherein said processor pre-processes said third image prior to combining with said first image to compensate for differences in colour temperature between said ambient light and said light from said illumination means.
11. Apparatus according to claim 10 wherein said processor computes a transformation that maps colour intensity data obtained for said third image onto said processed first captured image.
12. Apparatus according to claim 5 wherein said processor includes a blending stage for blending together edges of areas of said first image which have been replaced by corresponding areas from another image.
13. Apparatus according to claim 1 wherein said processor spatially matches areas or points in said captured images by identifying similar features in each image and producing a mapping transform which ensures

that areas of each image that correspond to identical areas in corresponding images are combined.

14. Apparatus according to claim 1 wherein a shield (415) is provided
5 around at least part of said illumination source (106) to prevent ambient light from striking said document (102) from said illumination source (106).

15. Apparatus according to claim 1 which further includes a second
10 illumination source for illuminating said document, and wherein said controller provides said first control signal to said read-out circuit to capture said first image of said document when illuminated by said first illumination source means and by said ambient light but not said second illumination source, and further wherein said controller provides an
15 additional control signal to said read-out circuit to capture an additional image of said document when said document is illuminated by said second illumination source and by said ambient light without being illuminated by said first illumination source;
said processor processing said first captured image with said additional
20 captured image to produce said final image of said document.

16. Apparatus according to claim 15 wherein said processor combines
said first image and said additional image to produce a final image in which
value of at least one data point in said final image is a minimum value
25 selected from corresponding points in said first image and said additional image.

17. Apparatus according to claim 1 wherein said image capture device
comprises a digital camera.

18. A method of capturing an image of a document at least partially illuminated by ambient light, said method comprising providing a controllable light source;
capturing a first image of said document with said light source illuminating
5 said document at a first intensity;
capturing a second image of said document when illuminated by said light source at a second, lower, intensity; and processing said first captured image with said second captured image to produce a final image of said document, wherein said second lower intensity is greater than or equal to
10 zero intensity but less than said first intensity.

19. The method of claim 18 wherein said first image and said second image are captured using identical exposures and said processor combines said images by subtracting said second image from said first image.

20. The method of claim 18 wherein said first image and said second image are captured at different exposures such that said first image and said second image are fully exposed, wherein said light source has an intensity during capture of said second image which is zero, and wherein said
20 method further comprises identifying areas or points in said first image that correspond to glare spots and replacing those areas or points with corresponding areas or points from said second image.

21. A digital image capture apparatus configured to capture an image of
25 a document (102) at least partially illuminated by ambient light, the apparatus comprising:
a digital camera (101) comprising a detector (107) arranged to capture an image of said document;
a light source (106) for illuminating said document,
30 a detector read-out circuit (108) for capturing image data from said detector (107) in response to a control signal;

a controller for controlling said detector read-out circuit (108) and said light source (106), wherein said controller provides a first control signal to said read-out circuit (108) to capture a first image of said document (102) when illuminated by said light source (106) at a first intensity and by said ambient light to produce a first image captured at a first exposure, and wherein said controller further provides a second control signal to said read-out circuit to capture a second image of said document (102) when said document (102) is illuminated only by said ambient light; and a processor (112) arranged to process said first captured image with said second captured image to produce a final image of said document, and wherein said processor is further arranged to identify areas or points in said first captured image that correspond to glare spots, and to replace said identified points or areas with corresponding points or areas taken from said second image.

22. A digital image capture apparatus according to claim 21 wherein said processor includes a blending stage for blending together areas of said first image which have been replaced by corresponding areas of said second image.

23. A digital image capture apparatus configured to capture an image of a document (102) at least partially illuminated by ambient light, the apparatus comprising:

an image capture device (101) comprising a detector (107) adapted to capture an image of said document;
an illumination source (106) for illuminating said document,
a detector read-out circuit (108) for capturing image data from said detector (107) in response to a control signal;
a controller for controlling said detector read-out circuit (108) and said illumination source (106), in which said controller provides a first control signal to said read-out circuit (108) to capture a first image of said

document (102) when illuminated by said illumination source (106) at a first intensity and by said ambient light to produce a first image, and wherein said controller further provides a second control signal to said read-out circuit to capture a second image of said document (102) when
5 said document (102) is illuminated by said illumination source at a second, lower intensity and by said ambient light; and
processor (112) arranged to process said first captured image with said second captured image to produce a final image of said document.

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